



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : B65D 88/10, 90/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 99/30989 (43) International Publication Date: 24 June 1999 (24.06.99)</p>
<p>(21) International Application Number: PCT/GB98/03781 (22) International Filing Date: 16 December 1998 (16.12.98) (30) Priority Data: <div style="display: flex; justify-content: space-between;"> <div>9726499.8</div> <div>16 December 1997 (16.12.97)</div> <div>GB</div> </div> <div style="display: flex; justify-content: space-between;"> <div>9818629.9</div> <div>26 August 1998 (26.08.98)</div> <div>GB</div> </div> (71) Applicant (for all designated States except US): SEA CONTAINERS LTD. [-/-]; 41 Cedar Avenue, P.O. Box HM1179, Hamilton, Bermuda HMEX (BM). (72) Inventors; and (75) Inventors/Applicants (for US only): CLIVE-SMITH, Martin [GB/GB]; Container Group Technology Ltd., Wootton Paddox, Leek Wootton CV35 7QX (GB). BOTHAM, Dale [GB/GB]; 15 Thyme Way, Beverley, North Humberside HU17 8HX (GB). (74) Agent: MOLYNEAUX, Martyn, W.; Langner Parry, 52-54 High Holborn, London WC1V 6RR (GB).</p>		<p>(81) Designated States: CN, GB, ID, IN, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i></p>
<p>(54) Title: CARGO FREIGHT CONTAINER (57) Abstract A cargo freight container, and a method of manufacture of the container, in which corrugated walls of the container are formed from panels with pressed indentations, a portion of the panels proximate the upper and lower edges of the panels being without indentations so that the panels may be fixed to upper and lower rails of the container by the plane edge portions, be welding, gluing, riveting or nailing. Alternatively, roof panels may be joined to the wall panels by pressing and forming the plane edge portions of the panels together with edge portions of the roof panel sheets. Embodiments of the invention are described which have substantially uniform thickness over the whole pressed panel.</p> <div style="text-align: right;"> </div>		

BEST AVAILABLE COPY

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

CARGO FREIGHT CONTAINER

This invention relates to a cargo freight container and to a method of manufacture of the same.

5

In a cargo freight container it is a common requirement to maximise storage space within international constraints on the outside dimensions of the container, while minimizing weight and manufacturing costs. In order to optimize a weight to strength ratio of the container, it is well known for the walls of the container to be corrugated, with the corrugated walls being fixed to a top rail and a bottom rail. The corrugated panels forming the walls in the prior art are manufactured using a simple brakepress or a cold rolling machine. With the known corrugated side panels, the corrugations therefore extend the complete height of the panel and a weld line attaching the panel to the top and bottom rails must follow the shape of the corrugations, thus requiring constant changes of the angle of attack of a welding gun used to weld the panel to the rails. This results in a time-consuming manufacturing process.

Moreover, the depth of the corrugations, typically 35 mm, is space-consuming in terms of the cargo space occupied by the corrugations.

It has also been assumed in the prior art that the walls of the container must be designed to prevent the walls flexing substantially when a contained load bears on the walls.

The present invention seeks to provide a freight container manufactured by a faster and more efficient manufacturing process, which also mitigates some of these disadvantages of the manufactured container.

According to a first aspect of the invention there is provided a cargo freight container having a floor, walls and a roof, the cargo freight container including: a wall panel

having a upper end and a lower end, the wall panel having a plurality of substantially parallel pressed elongate indentations extending a part of the height of the wall panel between the upper end and the lower end to stiffen the wall panel, with a lower transverse edge portion of the sheet without said indentations, proximate the lower end and an unpressed upper transverse edge portion without said indentations proximate the upper end, a lower rail for joining a side wall to the floor, the wall panel being attached by said lower transverse edge portion to said lower rail, and means for attaching the wall panel by the upper transverse edge portion to the roof, whereby the wall panel forms at least a portion of a container wall.

Conveniently the elongate indentations extend substantially the height of the wall panel.

Advantageously the wall panel is joined to the roof by an upper rail.

Alternatively the wall panel is joined to the roof by a rolled and crimped, or rolled and glued, joint between the roof and the wall panel.

Preferably the plurality of pressed elongate indentations have substantially a same thickness as a thickness of unpressed portions of the panel.

Advantageously stress-relieving formations are provided between the pressed elongate indentations.

Conveniently the stress-relieving formation is a corrugation of lesser depth than the elongate indentations and substantially parallel to the elongate indentations.

Alternatively the stress-relieving formation is an arcuate portion curved in a plane perpendicular to a major surface of the panel.

Alternatively the stress-relieving formation is an angular depression extending in a plane perpendicular to a major surface of the panel.

- 5 Advantageously there is further provided at least one additional projecting member from a major face of the panel from which the indentation projects.

10 Conveniently the projecting member is a longitudinal member parallel with the indentations.

Alternatively the projecting member is a portion of said top or bottom rail.

- 15 Conveniently a wall of the container is formed from a plurality of pressed panels fixedly attached in side by side configuration to the lower rail.

20 Preferably the indentations have a trapezoidal transverse cross-section.

- 25 Alternatively the indentations have a planar transverse end face at an acute angle to a plane defined by the unpressed sheet.

Preferably the pressed panel is fixed to the rails with the indentation outward of the container.

- 30 Alternatively the pressed panel is fixed to the rails with the indentation inward of the container.

Preferably the wall panel is adapted to flex into a space between closely stowed containers.

- 35 Conveniently a portion of a rail to which a pressed panel is attached is adapted to flex torsionally with flexing of the panel but to be rigid against bending of a longitudinal axis.

According to a second aspect of the invention there is provided a method of manufacturing a cargo freight container, the freight container having a floor, a roof and two or more walls, a lower rail for joining the floor to
5 walls and means for joining the walls to a roof, the method comprising the steps of: (a) providing a rectilinear sheet having a first end and a second end, (b) producing a pressed panel from the sheet by forming with a pressing tool at least one elongate indentation extending a part of the
10 length of the sheet between the first end and the second end, retaining a transverse edge of the sheet without said indentation at the first end, (c) fixing said first edge without said indentation of the pressed panel to the lower rail and using said means for joining to the second end of
15 the pressed panel to the roof so that the panel forms at least a portion of a wall of the container.

Advantageously step (b) includes subjecting the panel to lateral compressive forces during pressing so that the
20 panel is not substantially thinned during pressing.

Conveniently step (c) includes providing an upper rail whereby the second end is joined to the roof.

25 Alternatively step (c) includes pressing and forming an edge of the second end of the panel with an edge of the roof and crimping or gluing the rolled second end of the panel to the formed edge of the roof.

30 The invention has the advantage that a corrugated panel may be joined to a rail by an uncorrugated edge, simplifying the attachment and avoiding corrosion traps. In addition, in some embodiment of the invention the depths of corrugation may be decreased, thereby increasing cargo
35 space. The drawing process also provides the advantage that the metal of the panel is thereby work-hardened, increasing its yield strength.

The present invention will now be described by way of example, with reference to the accompanying drawings in which:

5

Figure 1 is a perspective view of a cargo freight container of the prior art.

Figure 2 shows attachment of a wall of the container of Figure 1 to a bottom rail of the container,

Figure 3 shows a wall panel of the present invention forming part of the wall of a container,

Figure 4 shows the wall panel of Figure 3,

Figure 5 shows a transverse cross-section at line A-A of the wall panel of Figure 4,

Figure 6 shows a portion of a wall panel of a second embodiment of the present invention joined to a lower rail,

Figure 7 shows an horizontal cross-section of a wall of the prior art container of Figure 1,

25

Figure 8 shows an horizontal cross-section of the wall panel of Figure 6,

Figure 9 shows a horizontal cross-section of a wall panel of a third embodiment of the invention,

30

Figure 10 shows a horizontal cross-section of a wall panel of a fourth embodiment of the invention,

Figure 11 shows a vertical cross-sectional view of a fifth embodiment of the invention,

35

Figure 12 shows a wall flexing in a container of the invention stacked next to another container,

Figure 13 shows a pressed panel fixed to an outside
5 surface of an angle top side rail of the container of Figure 3;

Figure 14 shows a pressed panel fixed to the bottom of
a top rail in a sixth embodiment of the invention;

10

Figure 15 shows a pressed panel fixed to an outside
surface of a top rail in a seventh embodiment of the
invention;

15 Figure 16 shows a pressed panel fixed to an outside
surface of a top rail with the corrugations inward of the
container, in an eighth embodiment of the invention;

Figure 17 shows a pressed panel fixed to an inward-
20 facing bottom side rail of the container of Figure 3,

Figure 18 shows a pressed panel of the present
invention fixed to a 'C' bottom side rail,

25 Figure 19 shows a pressed panel of the present
invention connected to an upper rail which projects further
from a side of the container than the indentations,

Figure 20 shows an ninth embodiment of the invention in
30 which a roof panel is crimped or glued to a wall panel, and

Figure 21 shows a tenth embodiment of the invention in
which edge portions of the roof panel and wall panel are
bent inwardly through 90° before being joined together.

35

In the figures like reference numerals denote like
parts.

A cargo freight container 1 of the prior art is shown in Figure 1. The freight container 1 is of a welded steel construction including a framework formed of top rails 2, bottom rails 3 and vertical posts 4 to support a floor 5 and a roof 6 and to support corrugated wall panels 7 fixed to the top rails 2 and bottom rails 3. The connection between the side walls 7 and a bottom rail 3 is shown in Figure 2. The wall panel 7 is welded to a top flange 8 of the bottom rail 3 by a weld bead 9 which follows the contour of the corrugations of the panel 7. The depth of the corrugations is indicated by dimension D.

As in the prior art, the container 100 of the invention is also provided with a roof 106 fixed to a top rail 102 and a floor 105 fixed to a bottom rail 103. Referring to Figures 3-5, a wall panel 107 of the container has corrugations formed by pressing elongated indentations 110 into an otherwise flat sheet 115. As best seen in Figure 5, each indentation 110 has a trapezoidal cross-section, with walls 111 of indentation 110 converging from the sheet 115 to a parallel rectilinear face 112 and bowed end faces 113 making an arcuate junction 114 with the sheet and disposed generally at an acute angle to the plane of the sheet 115. A portion 116 of the sheet 115 between the indentations 110 and the edges is not indented, leaving first 125 and second 126 edges without indentations. Figures 4 and 5 show typical panels having three such indentations pressed therein.

Figure 3 shows a portion of a container 100 of the invention in which the pressed panels 107 are fixed to a top rail 102 and a bottom rail 103 by welding along a straight top edge 125 and straight bottom edge 126 respectively. Alternatively the panels 107 may be fixed to a top rail 102 or a bottom rail 103 by other fixing means, for example gluing, riveting or nailing.

Referring again to Figure 3, panels with indentations of different lengths may be used in different locations, in

particular a panel having an indentation 130 of a shorter length may be used on an end panel. In addition, panels of different widths and having different numbers of indentations, or different positioning of the indentations, may be used, in particular, at front and rear corners of a container. Alternatively, a single panel may form a complete wall of one side of a container.

Moreover, in the manufacture of a container according to the invention, the junction between the panel and the rail may be completely sealed in one operation, which is not possible when a corrugated edge is welded to an outer surface of a rail in the prior art, because gaps are necessarily left between the corrugations and the rail.

Furthermore, the method of pressing the panels produces in a single operation angled faces 113 to the corrugations 110, which tend to fend off neighbouring containers during stacking, thereby reducing the likelihood of damage to the walls 107 in collision with neighbouring containers.

In an embodiment of the invention, in order to maintain the thickness of the sheet 115 in the pressed indentations, lateral pressure may be exerted on a sheet 115 during pressing so that sheet material is fed into the indentations 110 as they are drawn to maintain the thickness of the walls 111, 113 of the drawn indentations 110. As a result, there will be some thickening of an unpressed portion of panel 116 between the end of the indentations 110 and the edges 125, 126 of the sheet. Figure 6 shows an alternative embodiment of the invention in which the ends or flutes 213 of the indentations 210 meet the unpressed plate 215 in a straight line rather than an arcuate line. In this embodiment the unpressed straight edge 226 of the pressed sheet 207 is welded to an upright portion 230 of an L-shaped lower rail 203 and the upper flange 8 of the bottom rail 3 required in the prior art (see Figure 2) may be dispensed with.

An upright portion 330 of side rail 303 might be lengthened, as indicated by the portion 333 in Figure 11, to overlap the flute 313 or peak. This helps to strengthen the panel 307 against bending moments generated in the panel 307 during operation. A cavity 331 formed between the indentation 310 and the rail 303 may be filled with a variety of structural or non-structural fillers or sections, as required, to prevent the cavity 331 becoming a moisture-trap and thereby encouraging corrosion.

A face 332 of the side rail 303 forms a surface for locating cargo and prevents the cargo rubbing against the relatively weak panel 307. Alternatively, no face may be provided.

The side wall 307 is also provided with an outstanding separate elongate member 340 which protrudes further from the wall of the container than the pressed indentation 310, to protect the pressed indentations 310 against collision. This elongate member 340 also has a transverse trapezoidal cross-section and angled interfaces 341 for fending off adjacent containers during stacking. Also shown in Figure 6 is a small corrugation 350 between the indentations 210, the function of which will now be described.

Figure 7 shows a horizontal cross-section of a corrugated wall 7 of the prior art. Normally in pressing corrugations, the material is stretched so that at least part of the corrugation is thinner than the pre-stamped sheet material.

However, in this invention, by ensuring the thickness of walls 411, 412 of the corrugation 410 are the same thickness as the unpressed material 415, the pressed panel over its whole surface has substantially uniform thickness. As a result, it is found that the depth of the corrugations can be reduced while maintaining the same stiffness as in the prior art. For example, the depth D1 can be reduced from the 35mm depth D of the prior art to 25mm-29mm.

Figure 8 also shows a small corrugation 350, or crease, in a valley 440 between two peaks formed by pressed indentations 410. When the panel 407 is subject to bending forces, the valley 440 experiences compressive forces and the wall 412 experiences tension forces. The panel 407 will ultimately fail when the forces on the valley 440 exceed the ability of the valley 440 to support such compressive stresses. It is found that by including a crease 350 in the valley 440 as shown, increased compressive forces can be borne without the panel 407 buckling. Furthermore, since the tensile stress in the wall 412 can be much greater than the compressive stress in the wall 440, by increasing the width of wall 440 and decreasing the width of wall 412, a neutral axis of the combined wall section comprising 412, 411, 440 moves towards wall 440 ensuring that high stress is generated in wall 412 and low stress in wall 440. As a result, the span between peaks 410 can also be increased. It is found that the ratio of the span to sheet thickness of the compressive side of the corrugation, that is, the innermost side of the panel 407, is no more than 50:1 in the prior art. That is, a sheet of a thickness of 2mm can support valleys of a length of 100mm. However, with the incorporation of the crease 350 in a valley 440, it is found that this valley width may be increased to, for example, 120mm. As a result, the number of corrugations 410 can be reduced, reducing the weight to strength ratio of the container.

Figures 9 and 10 show further embodiments of the invention incorporating alternative methods of increasing the compressive load which can be borne by the valleys 540, 640 by either bowing the valley as shown in Figure 9, or by incorporating an angular depression 650 extending from one peak 610 to the next, as shown in Figure 10. Such a bow 550 or angular depression 650 may extend in the direction of the peaks 510, 610 or in an opposite direction as shown in the Figures.

The same form of member 340 protecting an extension, as shown in Figure 6, can also be seen in another embodiment of the invention having a different shape lower rail 303 in Figure 11. As shown in Figure 11, the bending forces in relation to panels 307 can be reduced by adapting the connection between the rail 303 and panel 307, by making a leg 332 flexible so that the leg flexes with the flexing of the panel 307. However, as a load builds up in the panel 307, vertical tension forces in the panel 307 tend to pull the top and bottom rails 302, 303 together, thus it is advantageous if one or both the rails 302, 303 are torsionally flexible yet rigid against bending. Such rigidity of the rails 302, 303 can be enhanced by the member 340 which tends to prevent the rails 302, 303 from deflecting towards each other as well as protruding from the side of the container to protect the indentations 310.

In the embodiment shown in Figure 11, the panel 307 may be fixed to, for example, the bottom rail 330 by gluing with adhesive 360 and/or by fixing means 361, for example rivets or nails.

It has been noted onboard ship, where the major flexing of the walls of containers takes place, there is almost without exception a void 710 between adjacent stowed containers 700, as shown in Figure 12. It is found that panels 707 of the invention deflect under sideways loads more than the walls of conventional containers. However, it is further found that with the panels 707 of the invention, it is possible to allow the side panel 707 to deflect into the void 710 between containers in a standard stow such that containers 700 with temporarily, or even permanently, deflected walls 707 can still be operated within standard C-guide gauges 711.

Various methods of fixing the pressed panels of the invention to rail guides are shown in Figures 13-19. Figure 13 shows the pressed panel 107 fixed to an outer surface 101 of an angled top rail 102 of the container 100 of Figure 3,

with the indentations 110 outward of the container 100. The pressed panel 807 may alternatively be fixed by a pin joint 809 to the bottom surface 821 of a boxed shape top rail 802 as shown in Figure 14, or to an outer face 822 of a box-shaped top rail 802 as shown in Figure 15.

Alternatively, where structural requirements are not so demanding, it is possible for the peaks to be inward facing. This has the advantage that the panels may be easily fixed to known top and bottom rails. For example, the pressed panel may be fixed to the top rail 902 with indentations 910 inward of the container as shown in Figure 16.

Alternative methods of fixing the panels to the bottom rail are shown in Figures 17 and 18. In Figure 17 which corresponds with Figure 11, a pressed panel 307 of a container of the invention is fixed to a vertical flange 332 on a known inward facing bottom rail 303, as also shown in Figure 3. Alternatively, as shown in Figure 18, a pressed panel 307 may be fixed to an outer surface of a known 'C' shape bottom rail 803.

It will be apparent that in any of the embodiments shown in Figures 13, 15, 16-18, the unindented edge portion of the panel may be fixed to a face of a rail by gluing or fixing means such as rivets or nails.

In Figure 19 is shown a panel 110 fixed to a top rail 702 having a transverse cross-section of a query mark shape wherein a portion 720 of the rail 702 extends further from the side of the container than the indentations 110 to protect the indentations 110 in collisions with an adjacent container, or, in the case of an inward facing indentation, with cargo, or cargo handling equipment.

Figure 20 shows another embodiment of the invention which an upper top rail is formed within the roof and wall panel sheets for at least part of the length of a wall. In this case, the roof panel 906 and the indented panel 907 of

13

the invention are pressed, rolled and crimped or glued together at right angles to each other along adjacent edges 960,970. In such an arrangement the rolled edges 960,970 provide sufficient stiffening of the joint except in end panels where top rails are still required to absorb stresses to which the container is subject during handling.

Figure 21 shows another embodiment of the invention similar to that shown in Figure 20, in which edge portions 961, 971 of the roof 906 and wall panel 907 are bent inwardly so that the edges 961, 971 can be joined by welding, gluing or fixing means such as nails or rivets, to form a top rail for at least part of a length of a wall.

CLAIMS

1. A cargo freight container having a floor, walls and a roof, the cargo freight container including:

5

a wall panel having an upper end and a lower end, the wall panel having a plurality of substantially parallel pressed elongate indentations extending a part of the height of the wall panel between the upper end and the lower end to stiffen the wall panel, with a lower transverse edge portion of the sheet without said indentations proximate the lower end and an upper transverse edge portion without said indentations proximate the upper end,

15 a lower rail for joining a side wall to the floor, the wall panel being attached by said lower transverse edge portion to said lower rail, and

means for attaching the wall panel by the upper transverse edge portion to the roof,

whereby the wall panel forms at least a portion of a container wall.

25 2. A cargo freight container as claimed in claim 1, wherein the elongate indentations extend substantially the height of the wall panel.

3. A cargo freight container as claimed in claims 1 or 2, wherein the wall panel is joined to the roof by an upper rail.

4. A cargo freight container as claimed in claims 1 or 2, wherein the wall panel is joined to the roof by a joint made by pressing and forming edges of the wall panel and roof together and crimping, gluing or fixing the edges together by fixing means.

5. A cargo freight container as claimed in any of the preceding claims, wherein the plurality of pressed elongate

15

indentations have substantially a same thickness as a thickness of unpressed portions of the panel.

6. A cargo freight container as claimed in any of the preceding claims, wherein stress-supporting formations are provided between the pressed elongate indentations.

7. A cargo freight container as claimed in claim 6, wherein the stress-supporting formation is a corrugation of lesser depth than the elongate indentations and substantially parallel to the elongate indentations.

8. A cargo freight container as claimed in claim 6, wherein the stress-supporting formation is an arcuate portion curved in a plane perpendicular to a major surface of the panel.

9. A cargo freight container as claimed in claim 6, wherein the stress-supporting formation is an angular depression extending in a plane perpendicular to a major surface of the panel.

10. A cargo freight container as claimed in any of the preceding claims, wherein there is further provided at least one additional projecting member from a major face of the panel from which the indentation projects.

11. A cargo freight container as claimed in claim 10, wherein the projecting member is a longitudinal member parallel with the indentations.

12. A cargo freight container as claimed in claim 10, wherein the projecting member is a portion of said top or bottom rail.

35

13. A cargo freight container as claimed in any of the preceding claims, wherein a wall of the container is formed from a plurality of pressed panels fixedly attached in side by side configuration to the lower rail.

14. A cargo freight container as claimed in any of the preceding claims, wherein the indentations have a trapezoidal transverse cross-section.

5

15. A cargo freight container as claimed in any of the preceding claims, wherein the indentations have a planar transverse end face at an acute angle to a plane defined by the unpressed sheet.

10

16. A cargo freight container as claimed in any of the preceding claims, wherein the pressed panel is fixed to the rails with the indentation outward of the container.

15 17. A cargo freight container as claimed in any of claims 1 to 15, wherein the pressed panel is fixed to the rails with the indentation inward of the container.

18. A cargo freight container, as claimed in any of the preceding claims, wherein the wall panel is adapted to flex into a space between closely stowed containers.

19. A cargo freight container wherein a portion of a rail to which a pressed panel is attached is adapted to flex torsionally with flexing of the panel but to be rigid against bending of a longitudinal axis.

20. A method of manufacturing a cargo freight container, the freight container having a floor, a roof and two or more walls, a lower rail for joining the floor to walls and means for joining the walls to a roof, the method comprising the steps of:

(a) providing a rectilinear sheet having a first end and a second end,

(b) producing a pressed panel from the sheet by forming with a pressing tool at least one elongate indentation extending a part of the length of the sheet

17

between the first end and the second end, retaining a transverse edge of the sheet without said indentation at the first end,

- 5 (c) fixing said first edge without said indentation of the pressed panel to the lower rail and using said means for joining the second end of the pressed panel to the roof so that the panel forms at least a portion of a wall of the container.

10

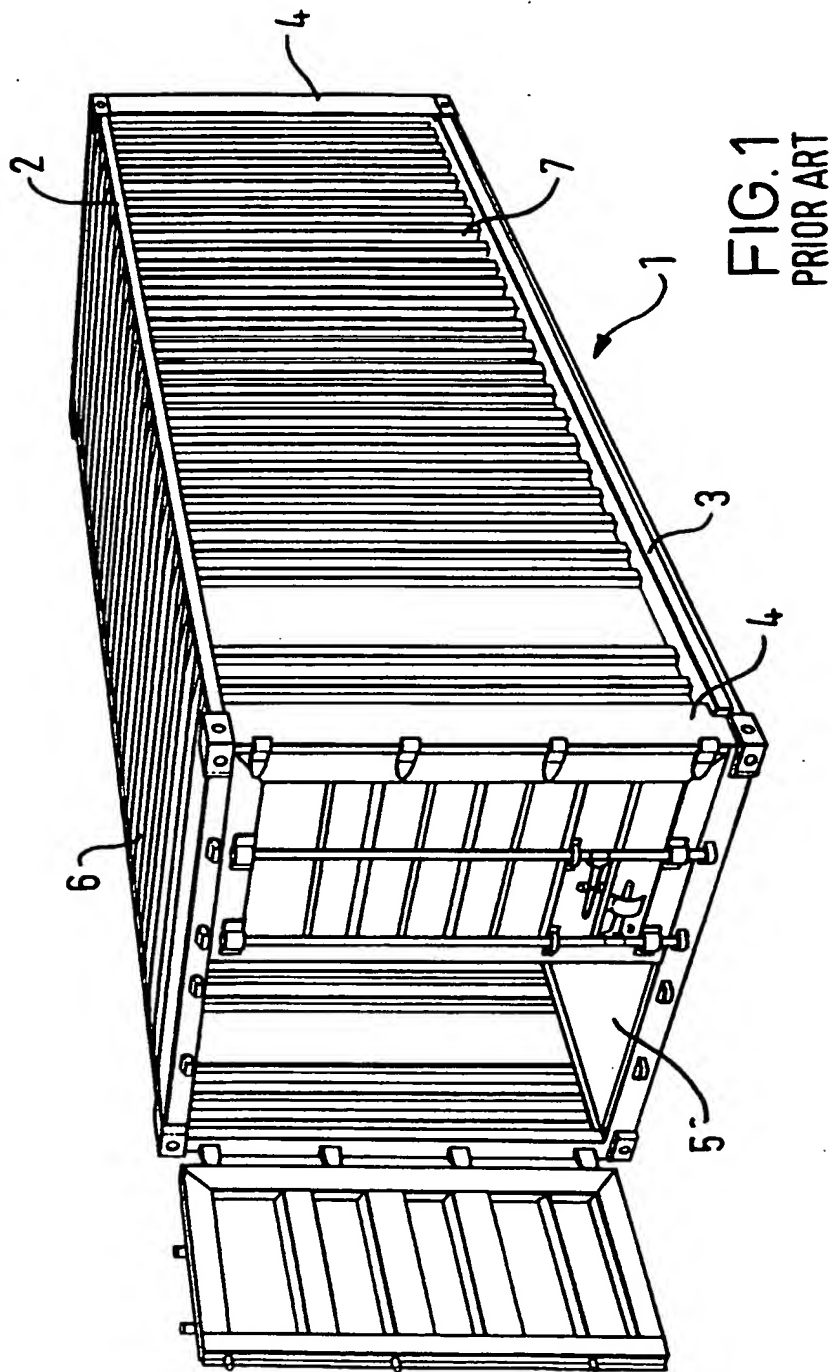
21. A method as claimed in claim 20, wherein step (b) includes subjecting the panel to lateral compressive forces during pressing so that the panel is not substantially thinned during pressing.

15

22. A method as claimed in claims 20 or 21, wherein step (c) includes providing an upper rail whereby the second end is joined to the roof.

- 20 23. A method as claimed in claims 20 or 21, wherein step (c) includes pressing and forming an edge of the second end of the panel with an edge of the roof and crimping or gluing the rolled second end of the panel to the formed edge of the roof.

1/9



2/9

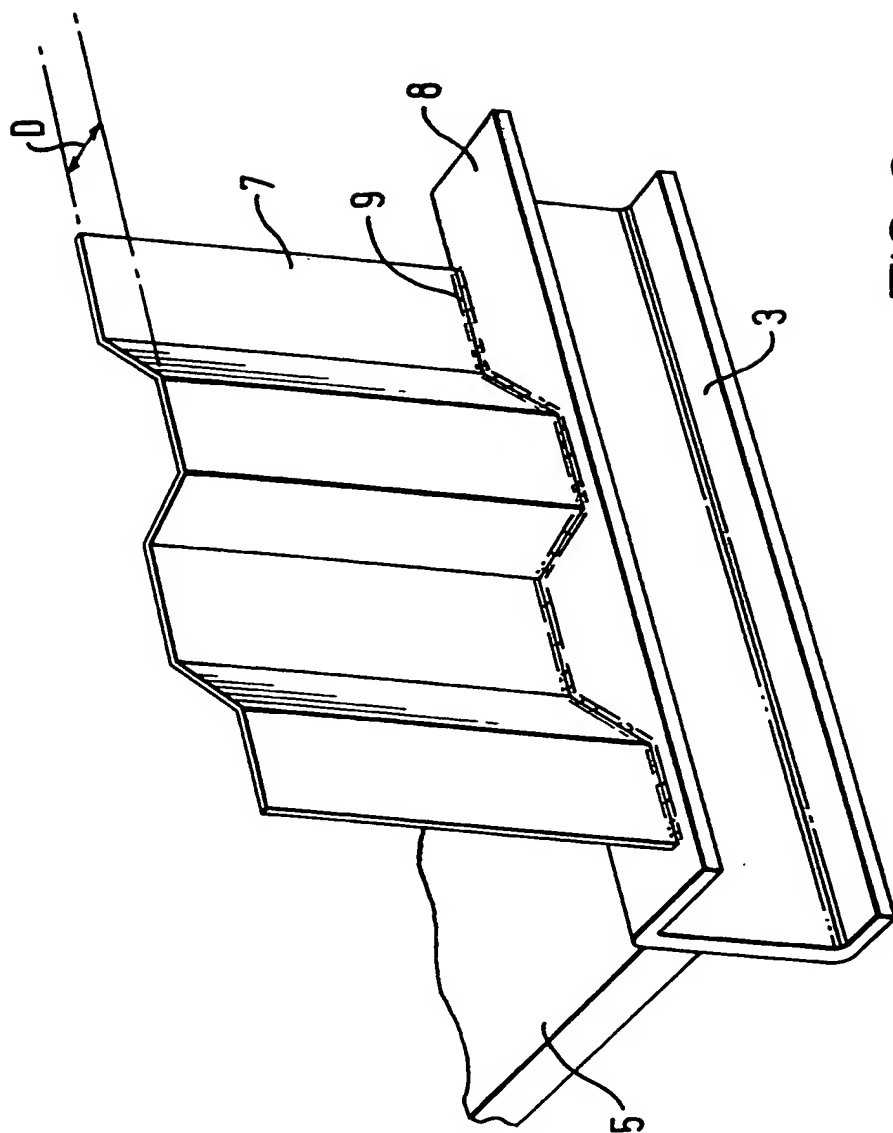
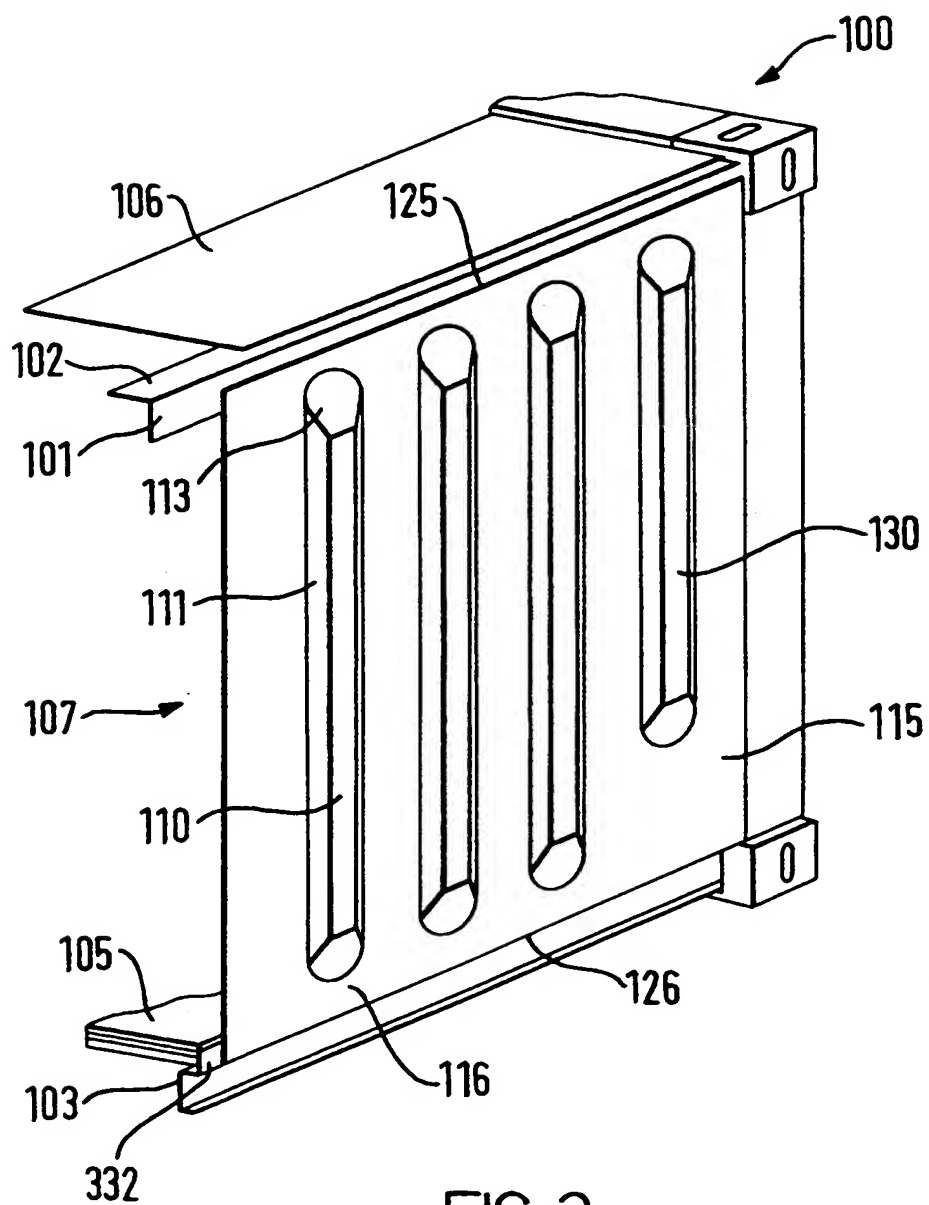


FIG. 2
PRIOR ART

3 / 9



4 / 9

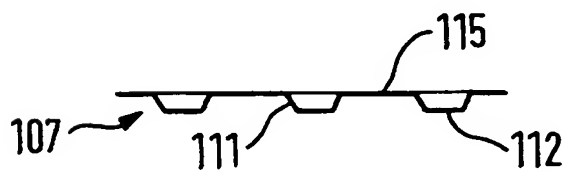
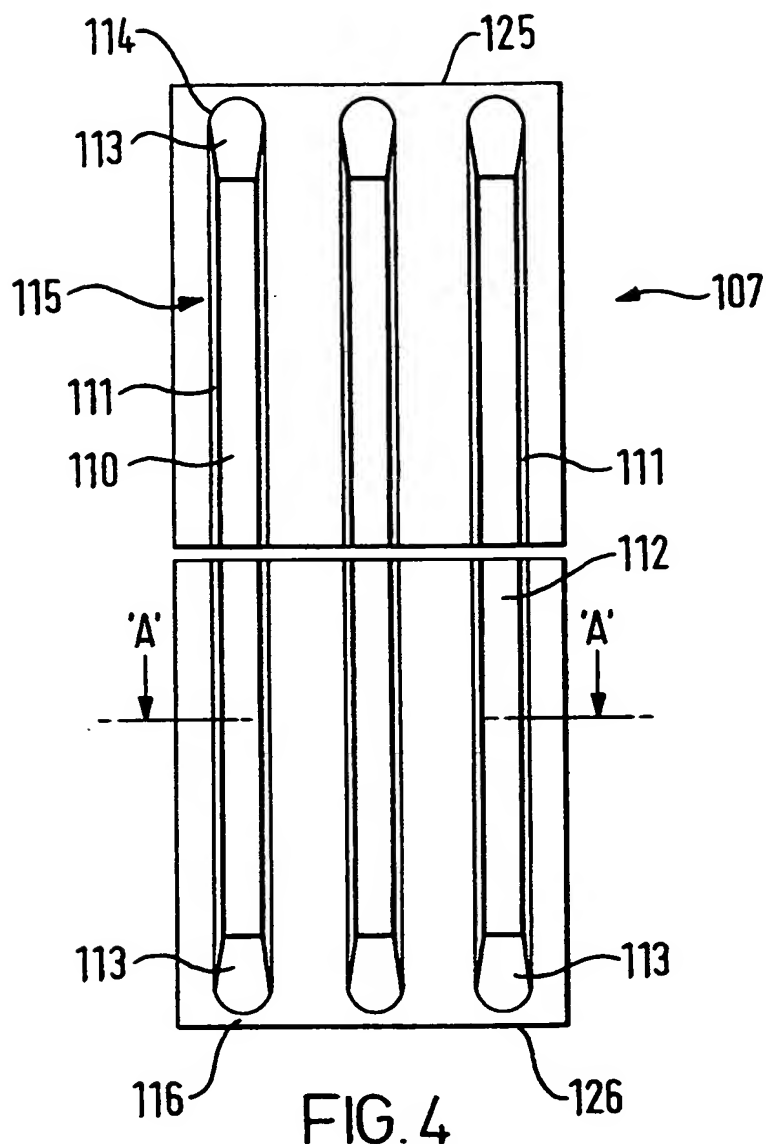
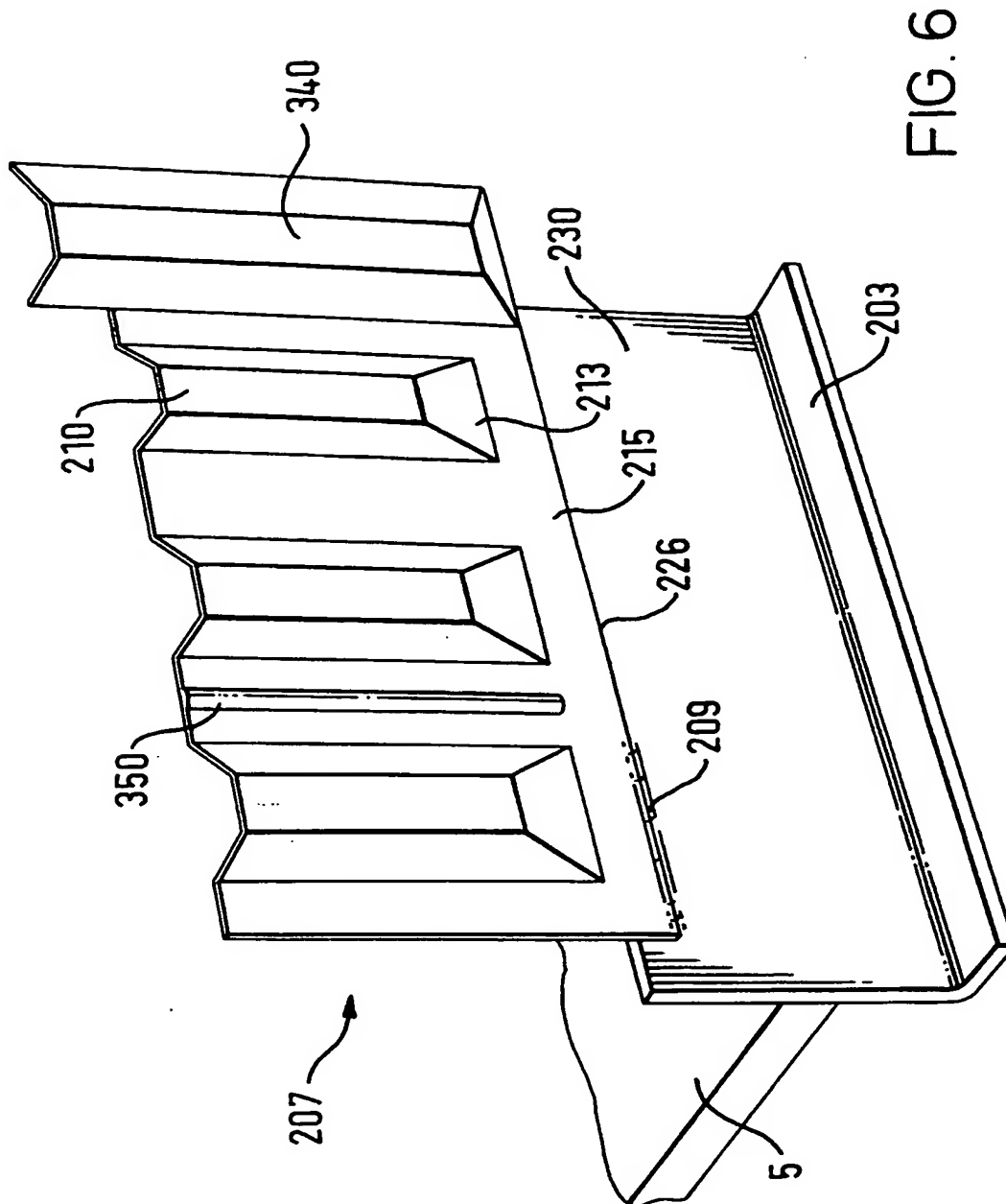


FIG. 5



6 / 9



FIG. 7
PRIOR ART

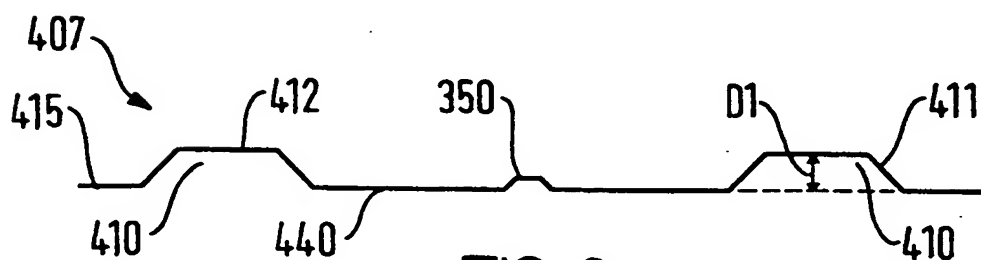


FIG. 8

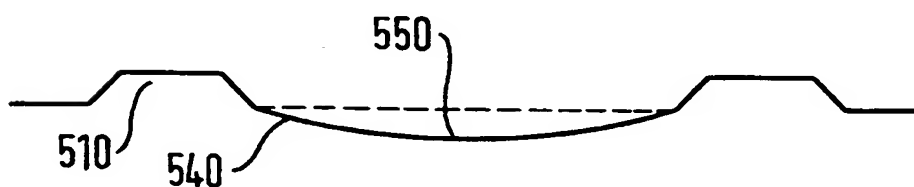


FIG. 9

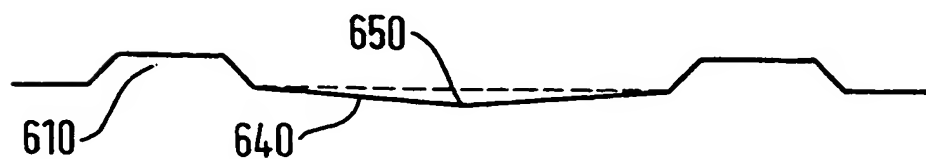


FIG. 10

7/9

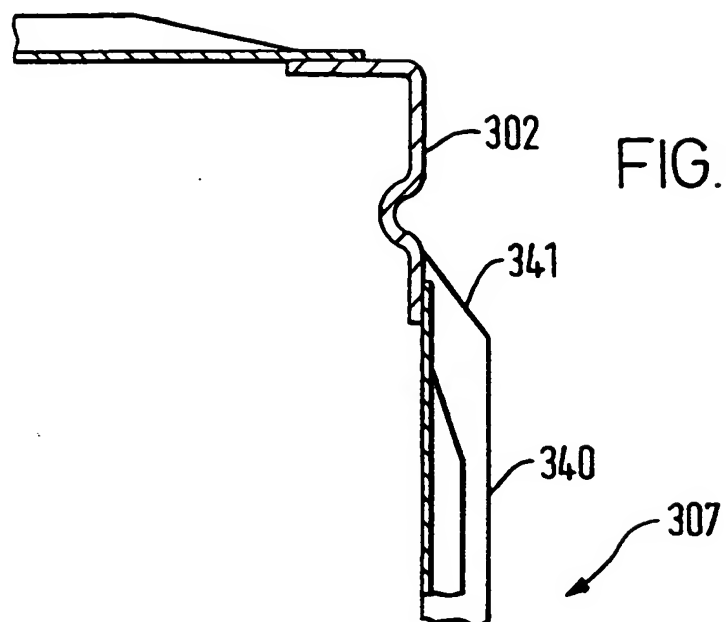


FIG.11

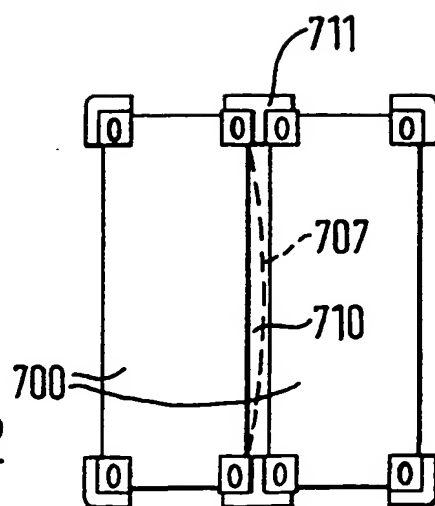
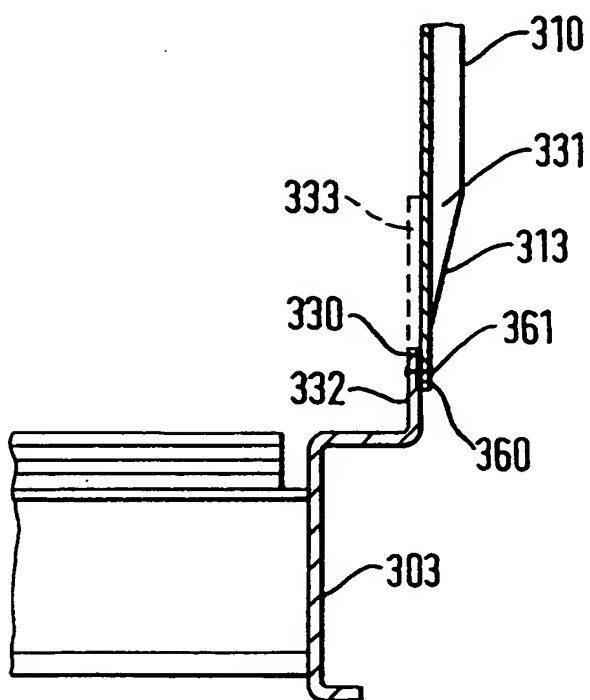


FIG.12

8 / 9

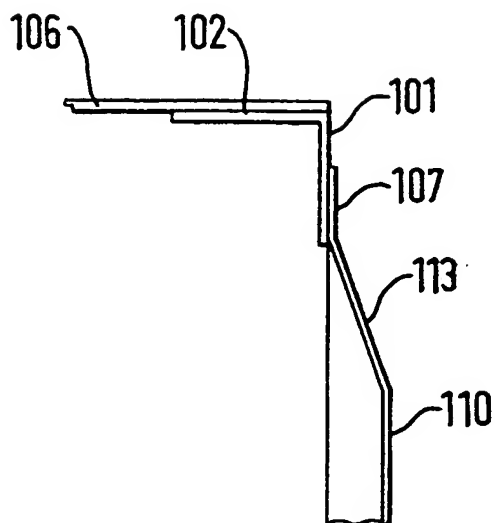


FIG. 13

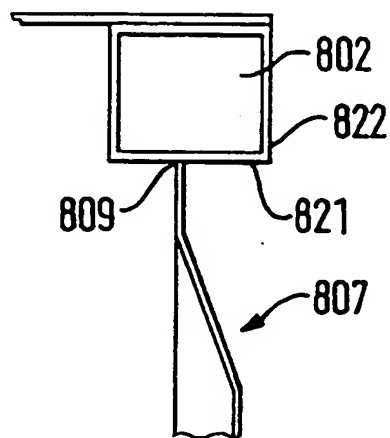


FIG. 14

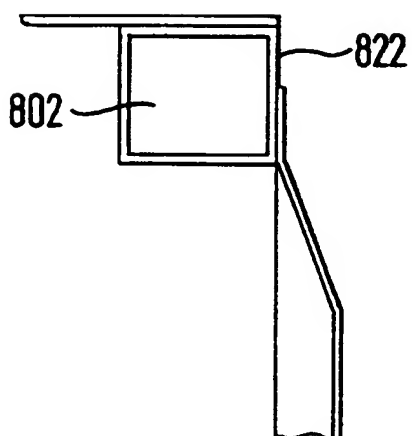


FIG. 15

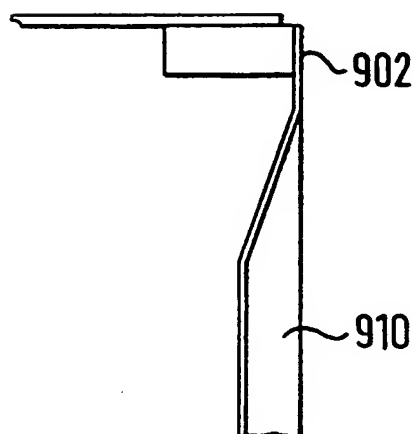


FIG. 16

9 / 9

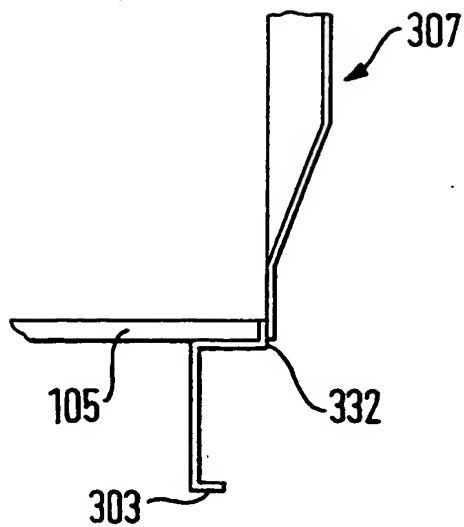


FIG. 17

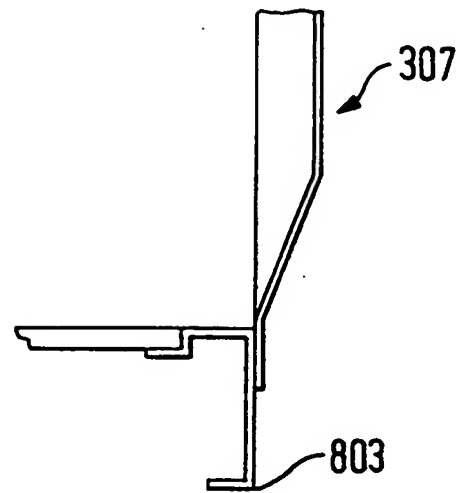


FIG. 18

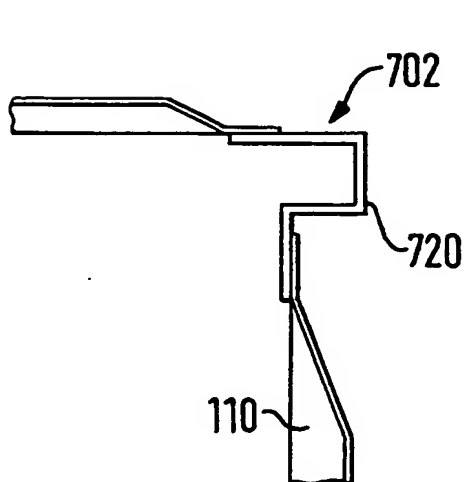


FIG. 19

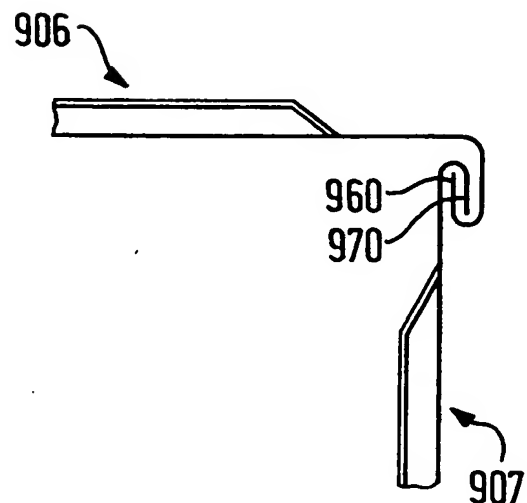


FIG. 20

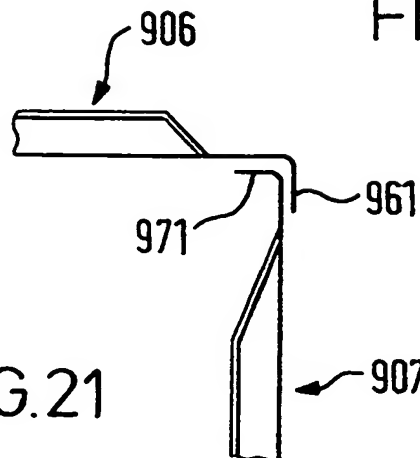


FIG. 21

INTERNATIONAL SEARCH REPORT

In ternational Application No

PCT/GB 98/03781

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B65D88/10 B65D90/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 828 965 A (YARBROUGH J) 13 August 1974 see the whole document	1-3, 5, 10-16, 20, 22
X	FR 2 351 728 A (FRUEHAUF FRANCE) 16 December 1977 see the whole document	1-3, 5, 13-15, 17, 20, 22
X	FR 2 303 925 A (DUPUIS POL) 8 October 1976 see the whole document	1, 10-12, 20
X	DE 122 769 C (DELACRE) 28 June 1900 see figures 1-3, 6	1, 2, 6-9, 20
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

8 March 1999

Date of mailing of the international search report

24/03/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Béraud, F

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03781

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 27 926 A (NETTHÖFFEL) 23 March 1972 see the whole document	1,16,17, 20
A	CH 434 688 A (SCHÜTZ) 30 April 1967 see the whole document	1,20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/03781

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3828965 A	13-08-1974	NONE	
FR 2351728 A	16-12-1977	NONE	
FR 2303925 A	08-10-1976	NONE	
DE 122769 C		NONE	
DE 2027926 A	23-03-1972	NONE	
CH 434688 A		NONE	

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.